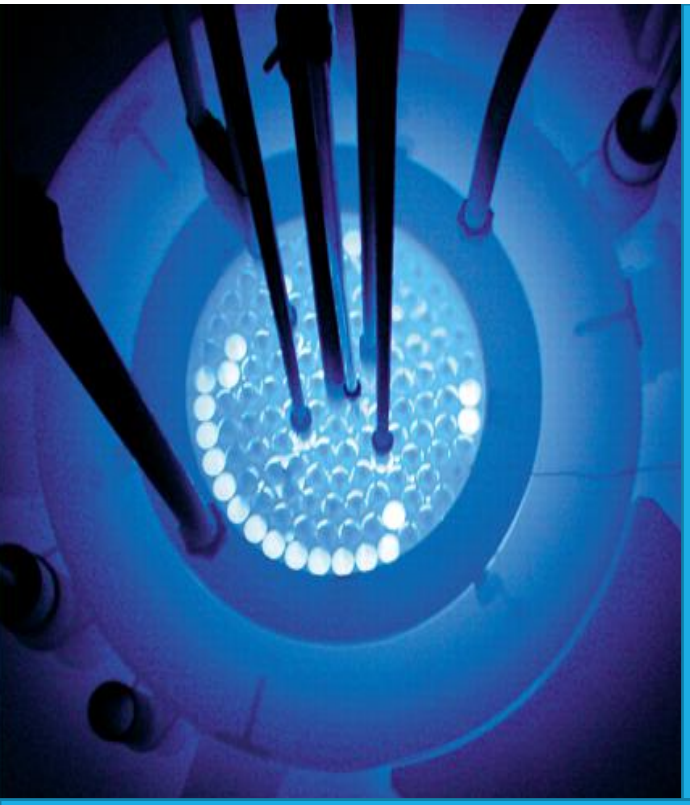

U.S.NRC
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NMSS ACTIVITIES ON ATF AND INCREASED ENRICHMENT

FCSE CER Presentation
By Marilyn Diaz
September 2019

ITEMS TO DISCUSS

Background

Major Accomplishments

NMSS Activities and Updates

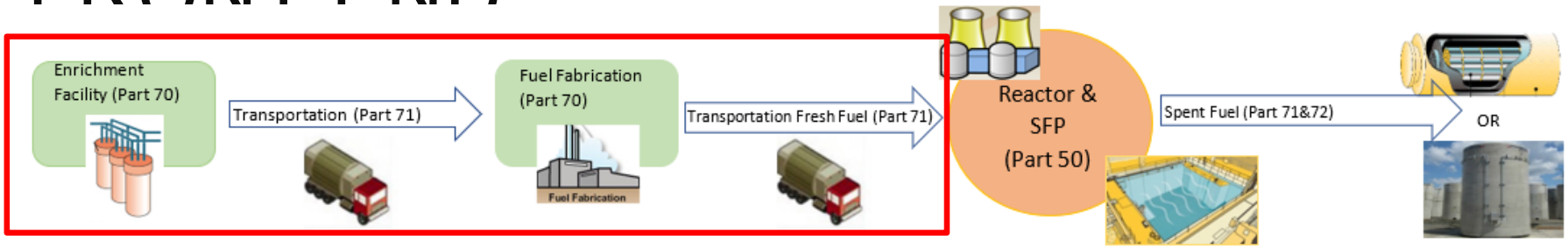
Licensing Critical Path

Conclusion

BACKGROUND

- Accident Tolerant Fuel (ATF) is a set of new technologies that have the potential to enhance safety at U.S. nuclear power plants by offering better performance during normal operation, transient conditions, and accident scenarios.
- The nuclear industry is working to deploy batch loads of accident tolerant fuel designs in the operating nuclear reactors by late 2023.
- The NRC staff is taking steps to make agency licensing processes more efficient and effective to enable timely licensing/certification.
- ATF Project Plan – Document available in ADAMS (ML18261A414).
- Office of Nuclear Material Safety and Safeguards (NMSS) is responsible for the oversight of the front-end and back-end of the fuel cycle.

ATF REGULATORY ACTIONS – FRONT END



- LWR Fuel Types
  - Conventional uranium oxide (UO_2)–Zr clad fuel (up to 5% enrichment(E))
  - Conventional UO_2–Zr clad fuel (up to 10%)
  - ATF – UO_2 fuel with different cladding
  - ATF – UO_2 fuel with different cladding (up to 10%)
  - ATF – Non-UO_2 fuel with different cladding
  - ATF – Non-UO_2 fuel with different cladding (10%<E<20%)

NMSS MAJOR ACCOMPLISHMENTS - LICENSING

- Issued a letter of authorization to Global Nuclear Fuels for shipment of lead test assemblies in the RAJ II package.
- Issued a letter of authorization to Westinghouse for one shipment of two types of ATF pellet designs, each in different lead test assemblies in the Traveller package.
- Issued a certificate of compliance to Framatome authorizing transport of ATF assemblies in the MAP-12/MAP-13 packages.
- Approved a license amendment to URENCO Louisiana Energy Services (LES) to modify their validation report to allow the use of MCNP 6 to perform criticality safety calculations in August 2019.

NMSS ACTIVITIES AND UPDATES

- Nuclear industry is now considering the development of ATF and conventional fuel concepts with higher enrichment.
  - High assay low enriched uranium (HALEU) = 5% < E < 20%
- NRC developed the high burnup and increased enrichment (HBU+IE) project plan.
  - Document available in ADAMS (ML19242E192).
  - Public Meeting on September 12, 2019.
- In early September, NRC sent a letter to the Nuclear Energy Institute that identifies NMSS licensing critical path to support industry's goal of ATF deployment in 2023.
  - Document available in ADAMS (ML19235A265).
- Currently reviewing an application from GE-Hitachi for transport of irradiated ATF in the GE-2000 package. The review is expected to be

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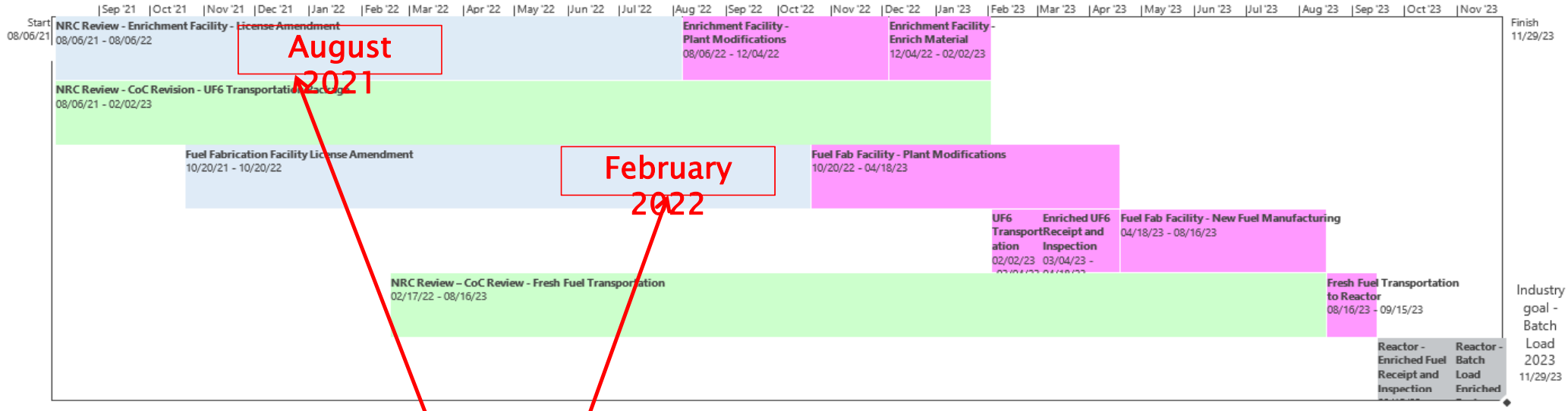
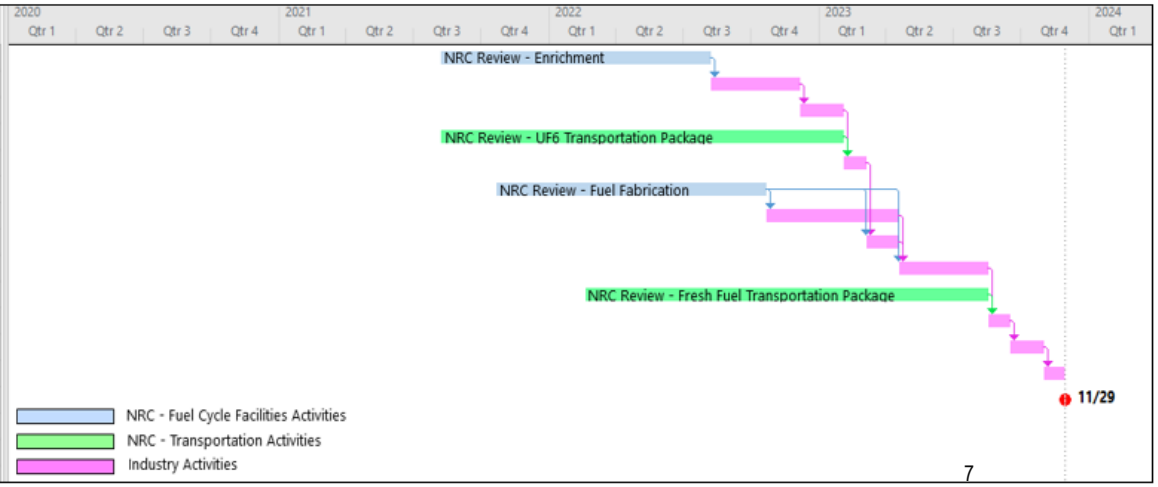
NRC Critical Path Schedule of Potential Licensing Actions related to ATF with Increased Enrichment (<10%)



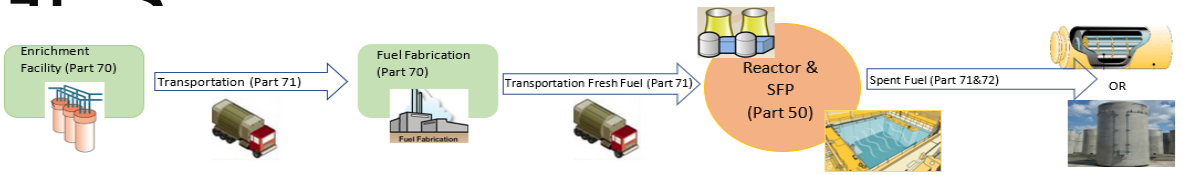
GANTT CHART

	Task Name	Duration	Start	Finish
1	**NRC Review - Enrichment Facility - License Amendment**	365 edays	Fri 08/06/21	Sat 08/06/22
2	Enrichment Facility - Plant Modifications	120 edays	Sat 08/06/22	Sun 12/04/22
3	Enrichment Facility - Enrich Material	60 edays	Sun 12/04/22	Thu 02/02/23
4	**NRC Review - CoC Revision - UF6 Transportation Package**	545 edays	Fri 08/06/21	Thu 02/02/23
5	UF6 Transportation	30 edays	Thu 02/02/23	Sat 03/04/23
6	**Fuel Fabrication Facility License Amendment**	**365 edays**	**Wed 10/20/21**	**Thu 10/20/22**
7	Fuel Fab Facility - Plant Modifications	180 edays	Thu 10/20/22	Tue 04/18/23
8	Fuel Fab Facility - Enriched UF6 Receipt and Inspection	45 edays	Sat 03/04/23	Tue 04/18/23
9	Fuel Fab Facility - New Fuel Manufacturing	120 edays	Tue 04/18/23	Wed 08/16/23
10	**NRC Review - CoC - Fresh Fuel Transportation**	545 edays	Thu 02/17/22	Wed 08/16/23
11	Fresh Fuel Transportation to Reactor	30 edays	Wed 08/16/23	Fri 09/15/23
12	Reactor - New Enriched Fuel Receipt and Inspection	45 edays	Fri 09/15/23	Mon 10/30/23
13	Reactor - Batch Load Enriched Fuel	30 edays	Mon 10/30/23	Wed 11/29/23
14	Industry goal - Batch Load 2023	1 day	Wed 11/29/23	Wed 11/29/23



Note: All durations for industry's activities are estimated. Start to Finish dates were selected using industry's published goal for ATF deployment (2023 – fall reactor outage) and going backwards for the steps needed to support deployment date.

CHALLENGES



- Fuel Cycle Facilities
  - All commercial fuel cycle facilities are licensed to produce up to 5% enriched material.
  - NRC is not aware of plans to enrich material above 5%.
- UF6 Transportation
  - Existing UF6 transportation packages are approved for up to 5% enrichment.
  - 10 CFR 71.55 limit to 5% enrichment – water intrusion analysis.

CONCLUSION

- NRC staff believes the current regulatory framework is adequate for the licensing of ATF and ATF with high burn up and increased enrichment fuel designs.
- NRC identified regulatory actions critical path based on available information. Letter sent to NEI request feedback on critical path.
- To improve the efficiency of regulatory efforts, the NRC encourages NMSS licensees, certificate holders and applicants to engage in pre-application discussions and/or share any plans for submittals or licensing strategy.